DOCUMENT RESUME

ED 138 287 IR 004 716

AUTHOR Pelczarski, Mark
TITLE Management of an Educational Computer System. Illinois Series on Educational Application of Computers. Number 10.
PUB DATE Sep 76
NOTE 11p.; For related documents, see IR 004 715 and IR 004 719 ; Appendices B and C may be marginally legible due to small print of the original

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS Computer Programs; *Computers; *Educational Facilities; Facility Guidelines; Information Services; *Management; On Line Systems; Secondary Education
IDENTIFIERS DEC 10

ABSTRACT

This paper deals with the management of computer systems used in educational institutions. Experiences are drawn from the use of the DEC 10 system at the University of Illinois. The management of a computer facility is divided into three areas. The first area, general upkeep, relates to providing sign-ons, storage, and computer time for everyone. The second area is the collecting and maintaining of information on available programs. The last area is concerned with providing easy operation and use of the computer. Appendices include a list of DEC 10 programs for secondary education and a ROUTER program which provides access to any of the DEC 10 programs. (DAG)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

ED138287

U S DEPARTMENT OF HEALTH
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

Number 10

The Illinois Series on
Educational Applications of Computers

Management of an Educational Computer System

Mark W. Pelczarski

September 1976

PERMISSION TO REPRODUCE THIS COPYRIGHTED MATERIAL HAS BEEN GRANTED BY
Bruce Hicks
TO ERIC AND ORGANIZATIONS OPERATING UNDER AGREEMENTS WITH THE NATIONAL INSTITUTE OF EDUCATION. FURTHER REPRODUCTION OUTSIDE THE ERIC SYSTEM REQUIRES PERMISSION OF THE COPYRIGHT OWNER

College of Education
Department of Secondary Education
University of Illinois
Urbana, Illinois

BEST COPY AVAILABLE

© Bruce Hicks (1976)

IR004716

Table of Contents

I. Introduction 1

II. Management

2.1 General Upkeep 2 - 3

2.2 Collection and Distribution of Program Information 3 - 4

2.3 Providing for Easy Computer Operations 4 - 5

III. Summary 5

Appendix A: Program Information Form 6

Appendix B: Sample List of Available Programs (from INFO) 7

Appendix C: ROUTER: Listing, Program Files, Sample Run 8

I. Introduction

This paper deals with the management of computer systems used in educational institutions. It is particularly about the system of management set up by the Department of Secondary Education at the University of Illinois with the DEC System 10 time shared computer. It is general, however, and hopefully will be applicable to many other educational computer systems.

The DEC 10 computer system is operated by the Computing Services Office (CSO) at the University of Illinois. The Department of Secondary Education has an account with CSO that provides computer time and disk space (storage for programs). CSO maintains the computer and has terminals located throughout campus. The Department itself owns an Infoton CRT (Cathode Ray Tube) terminal and a television monitor that can be wired to the terminal for an extra screen used in demonstrations. The time sharing facilities available to the department are therefore similar to many time shared systems owned or leased by schools.

The other two general types of computers are batch systems and maxi-calculators. Batch systems are those in which programs are recorded on punched or marked sense cards, run in batches, and usually output on a line printer. There is seldom any user interaction during execution. Some batch systems are owned or leased by schools for instructional purposes and administrative jobs such as scheduling, absentee lists, and payroll, while other districts may own systems primarily for administrative use, allowing student programs to be run at night. Some industries also will allow night usage by schools.

Maxicalculators are actually small, relatively portable computer systems. They can be used interactively, and programs can be stored on cassette tapes or inexpensive disks. Some can run or simulate batch jobs. Output devices vary from CRT's to thermal and line printers. Maxicalculators were discussed in depth in ISEAC Numbers 5 and 6.

Parts of the management discussed in this paper will pertain to every type of system. Some areas of management will have to be modified to fit a school's particular style of computer usage. Our management methods, however, should serve as a good starting point for considering the management of any educational computer system.

Questions may be directed to Mark Pelczarski, c/o Department of Secondary Education, 398 Education, University of Illinois, Urbana, Illinois 61801.

II. Management

Management of an educational computer facility can be divided into three areas. The first is general upkeep: the continuing jobs of providing sign-ons, storage, backup storage, and computer time for everyone, maintenance of the computer, and making programs available to people who need them, when they need them. The second aspect is collecting and maintaining good information about the programs available on the system. The third is providing for easy operation and use of the computer. People should not have to be computer experts to be able to use computers, and indeed there are few computer experts working in schools.

Throughout this paper the assumption is made that there is a director or manager in charge of these tasks and of making the facility accessible to users in the school. This person should have some computer background (programming and computer use) and should be familiar with the computer being used. It is important that he obtain any manuals regarding the computer, read through them, and keep them on hand. He should know what can and cannot be done on the system, or be able to find out quickly. This person should have a fairly thorough knowledge of programs available on the system pertaining to different subject areas, and should make himself accessible as a consultant to the users.

2.1 General Upkeep

General upkeep involves the day-to-day scheduling and maintenance of the computer facility. Non-computer tasks include scheduling user time on the computer, maintenance of the actual computer hardware, and keeping computer information up to date and available. Computer work includes distribution of actual computer time to those who need it (on computers that have accounting systems and require certain sign-ons or passwords), allocation of program storage space (disk and tape storage), and maintaining proper program protection, allowing access for those who need it, but, for example, letting programs be changed only by authors of the programs.

Computer scheduling for us consists of posting a sign-up sheet each week with each day divided into half-hour slots from 8:00 to 5:00. Students sign up to reserve the terminal when they need to use or need to take it elsewhere for a project.

This system would of course be more complicated for schools. Priorities would have to be set for classes, administration, students, and staff. With multiple terminals, one or more could always be set aside for students, while others are being used at designated times for administration, classes, and staff, with sign-up sheets circulated for class and staff use. Batch computer and maxicalculator schedules can be set up with designated times for each type of user's priority, with other jobs allowed if there are none running on first priority. Student time could be reserved on a sign-up system, with a maximum amount of reserved time allowed per student.

CSO handles most of our maintenance, but for schools that own their computer or some of the hardware, reliable maintenance through a contract with a company or by designated staff is vital. Not only is cost of maintenance important, but also the amount of time taken for repairs.

Allocation of disk space has to be done on a priority system if space is limited. Cases will arise where not enough space is available and procedures should be arranged for determining who gets how much.

Protection of programs and data files must be established to prevent accidental or illegal changes, deletions of important programs, or access to data files that should be secure. Tape storage allows the user to take important files off the system and keep them safe, but programs that need to be kept on disk should be secured also. The DEC 10 has an arrangement that allows one to specify for each program what he will allow others to do with it (change, list, or run). This system allows, for example, one person to be able to

change a program, an entire class to be able to run it, and no one else to have access. Whether a person has access or not is determined by his sign-on code when he uses the computer.

It is necessary to keep accurate, up to date information available about the computer. Thus, information about system, software, and procedural changes should be well documented, up to date, and available to users.

On systems in which programs are stored on disk it is worthwhile to have backup copies of everything on disk kept on magnetic tape or other storage (cards, paper tape) as a precaution against loss of programs due to disk malfunctions. On many systems this backup is done each night.

2.2 Collection and Distribution of Program Information

General upkeep and maintenance is essential with any computer system, but if a school wants to get maximum usage out of a computer people need to know what the computer can do and what programs are available. After much trial and error, the system that evolved in our department involves three sets of information on the computer programs.

The first set of information is common to almost all computers in some form. It consists of a directory, automatically created by the computer, of programs stored on the computer system. Some of these programs we value. Others are just practice programs by people learning to program; they will be deleted every few months. Information given by this system directory is limited (Name, Program Language, Length, Protection Codes, Date Created), but this can be supplemented by running and listing a program to find out what it does and how well it does it.

We find that the most helpful way to document what we have on the system is to set up in a file cabinet a library of programs, the second set of information. Enough space in a file cabinet is set aside for one manila folder for each program worth saving. In this folder is a Program Information Form (see Appendix A), a listing of the program, and, as we accumulate them, sample runs of the program. We also gather any data, critiques, suggestions, or reports pertaining to specific programs and include them in the folders to serve as help for those who might want to use or edit a program in the future. The folders are alphabetized by program name. We thus have a system that allows us, upon request, to find quickly all the information we have on a specific program. Most of the programs included in this file are also recorded on magnetic tape as a failsafe against any deletions or alterations of the copies on the system.

The third set of information allows us to publicize what programs we have so that people can come in and use them. Documentation in our files is of little value if the users don't know what programs can be made available to them. Using the INFO programs* we set up a list of all programs that we have documented in the folders, arranged in the list by subject area, with a short description and the status of each. We then run off copies of this list using INFOPR;* distribute them in classes and post them in the building (see Appendix B for a copy). This list is easily updated on the computer, and it allows people

*See ISEAC Number 9 about the INFO data manipulation and retrieval system.

who find programs that interest them to come to us and inquire about them, and we can quickly find the folder on the program and show them all available information about the program and its uses.

2.3 Providing for Easy Computer Operations

Suppose the computer is available and an interesting program has been found by a new user. We feel that it is now important for that user to get in and work with the computer as easily as possible. If he has no computer experience he should not be hindered by that fact. If he has no desire to learn to program, or to learn the intricacies of computer hardware or a set of monitor commands (other than the logging-in process), he should still be able to use the computer.

There are three areas in which to work on making program usage easy. First, there should be concise, simple to understand instructions posted or in handout form that describe the minimum computer knowledge necessary to use the machine: logging in, getting and executing a program, and logging off. There should also be some type of computer language reference sheets for those who are programming, giving a brief description of each computer command and its syntax.

The second area of operations needing attention is the computer monitor mode. By use of a program called ROUTER, we are able to let anyone get on the computer and use any of our programs after learning to type four lines: the LOGIN command, OLD ROUTER, RUN, and BYE. This facilitates easy terminal sessions for beginners, unclogged by computer jargon. We are able to append automatically a special library of our programs to any user's sign-on through the LOGIN command. Then through the ROUTER program the user is given short descriptions of each program and told to pick the number of the program he wishes to run. The programs in the special library can be run, but not changed by the user. After running a program, the user automatically returns to the ROUTER. Other choices given are to leave a note on the computer for the computer manager or to leave the ROUTER.

The ROUTER works through use of the CHAIN command, which allows one to jump from one program to another. The CHAIN command is programmed, so the user never sees it. Every program that the ROUTER chains to also chains back to the ROUTER at the end of execution. Program names and descriptions are stored in data files for the ROUTER. These data files can also contain names of other data files with program names and descriptions, allowing the user to choose general areas (such as PHYSICS programs) and then see a list of the programs in that area. A listing of the ROUTER is in Appendix C, along with a sample run. Instructions for setting up the ROUTER are in REMARK statements at the end of the listing.

The third area of operations is the programs themselves. Each program should be documented well for the user and for the computer manager. REMARK statements should identify the program and the author to anyone reading the listing. Variable and subroutine definitions should be either within the program or submitted on a sheet to be included in the folder for that program. Faults, suggested changes, and improvements should also be submitted for future reference.

Another type of documentation helps to insure that the user will understand the program. PRINT statements, for example, should be used generously enough to tell the program user exactly what he is doing. Instructions to the user should be clear from the beginning of the program, and the flow of the program should be easy to understand. Furthermore, each program should have a

quality that very few programs actually do have: they should be user-proof. When the user inputs a response, it should be checked against every expected answer, and then allocations should be made for unexpected answers. For example, if the program asks for a YES/NO answer, the program shouldn't assume that if the answer is not 'yes' that it is 'no'. An accidental press of the RETURN key could break the flow of the program. It is also convenient to the user if 'y' is accepted for 'yes', and 'n' for 'no'. An easy way to program this is to check if the first character is 'y', then check if it is 'n'. If it isn't 'n', ask the user to type 'YES' or 'NO'. Caution: in some versions of BASIC the string function that allows testing the first letter gives a program error if it is a null string; that is, if only the RETURN key was pressed. It is therefore necessary to check this condition first.

A general rule of thumb is that there should be no way the user can accidentally exit the program. Typing errors by the user should be caught and questioned, and means should be available for correction if he made an irreversible wrong choice (e.g., accidentally choosing to delete important data).

III. Summary

The following summary includes the major tasks in providing good service with an educational computer system.

I. General Upkeep

- A. Scheduling of terminal time
- B. Providing computer maintenance
- C. Allocation of computer time
- D. Keeping backup copies of programs
- E. Allocation of computer storage space (disk)
- F. Providing proper protection of programs
- G. Making programs available when needed

II. Information on Programs

- A. Listings of system directories
- B. "Library" files (folders) about each program
- C. Lists of available programs and descriptions to be distributed

III. Easy Operation of the Computer

- A. Simple, concise beginner's instructions
- B. Reference handouts for computer commands
- C. Computer routing to facilitate easy sessions at the terminals
- D. Programs well documented for possible alterations in the future
- E. Programs easy to understand and use, and user proof

Appendix A

Program Information

File Names:

Main Program:

Description:

Comments (Does it work properly? Is it well documented (for users and editors)? Is there off-line documentation?):

Programmer(s):

Language:

Approximate length in blocks:

Copy available: (dectape, paper tape, cards, listings)

Submitted by:

Date:

Please attach a listing and sample run of the program along with any other pertinent information, if possible. Otherwise leave information telling where such documentation can be found.

BH:jf
SE-939

SECONDARY EDUCATION DEC10 PROGRAMS

AREA	PROGRAM	DESCRIPTION	STATUS -- *
ADMINISTRATIVE			
ADMINISTRATIVE	INFO	INFORMATION STORAGE AND RETRIEVAL	WORKING 3PF/MIN 5DF/R/DT
ADMINISTRATIVE	SDFS	SCHOOL DIST. FINANCE SIMULATION	WORKING R/DT
ADMINISTRATIVE	SESAM5	GRADUATE RECORDS MODEL	WORKING DT
ADMINISTRATIVE	TSDS	TEACHING STAFF DISTRIBUTION SIMULATION	WORKING R/DT
BIOLOGY			
BIOLOGY	GENE	INHERITANCE OF GENETIC TRAITS	WORKING R/DT
BIOLOGY	LOCKEY	LOCK AND KEY ENZYME ACTION MODEL	WORKING R/DT
BIOLOGY	MALAR	MALARIA CONTROL SIMULATION	WORKING R/DT
BIOLOGY	POP	GYPSY MOTH POPULATION GROWTH SIMULATION	WORKING R/DT
BIOLOGY	STERL	INSECT CONTROL SIMULATION	WORKING R/DT
BIOLOGY	TAG	SAMPLING EXERCISE - SIMULATED FARM POND	WORKING R/DT
CMI			
CMI	BASMS	BASIC STUDY MANAGEMENT SYSTEM	LISTING ONLY 3PF/4DF
CMI	CAISP	COMPUTER AIDED INDIVIDUALIZED STUDY	DEVELOPMENTAL-WORKING 3PF/MIN 4DF/R/DT
CONSUMER ED.			
CONSUMER ED.	BANK	BANK TRANSACTION SIMULATION	WORKING R/DT
CONSUMER ED.	BUSDAY	BUSINESS DAY CLASS PROGRAM	WORKING 5DF/DT
CONSUMER ED.	TUTOR	SHORT FORM INCOME TAX TUTORIAL LESSON	WORKING-NOT COMPLETE 11PF/12DF/DT
CUE			
CUE	FOOD	FOOD FOR THOUGHT PROGRAM	UNCERTAIN 2PF/1DF/R/DT
CUE	HANDS	USE OF DETAIL; POETRY GENERATING	WORKING R/DT
CUE	RECIPE	NUTRITION PROGRAM	WORKING-NOT COMPLETE R/DT
ECOLOGY			
ECOLOGY	ECOGAM	PLANET MANAGEMENT GAME	WORKING 3PF/3DF/DT
ECOLOGY	POLUT	WATER POLLUTION SIMULATION	WORKING R/DT
ENGLISH			
ENGLISH	CLOZE	CLOZE READABILITY CALCULATION	FORTRAN LISTING ONLY
ENGLISH	LIBCAT	TUTORIAL LESSON - CARD CATALOGS	WORKING 2DF/R/DT
ENGLISH	POETRY	COMPUTER GENERATED RANDOM POETRY	WORKING 2PF/4DF/R/DT
ENGLISH	SPELL	SPELLING ALGORITHM	??? 3PF/1DF
GAMES			
GAMES	BJ	BLACKJACK	WORKING R/DT
GAMES	ECOGAM	PLANET MANAGEMENT GAME	WORKING 3PF/3DF/DT
GAMES	GUESS	NUMBER GUESSING GAME	WORKING R/DT
GAMES	HANG	'HANGMAN' WORD FINDING GAME	WORKING 1DF/R/DT
GAMES	LAFIV4	LOST AND FORGOTTEN ISLAND	WORKING 3PF/1DF/R/DT
GAMES	RICH	MOO -- COWS AND BULLS GAME	WORKING R/DT
MANAGEMENT			
MANAGEMENT	FILEM	DATA FILE MANIPULATION	WORKING R/DT
MANAGEMENT	ROUTER	PROGRAM ROUTER	WORKING MIN 1DF/R/DT
MATH			
MATH	INTRO & MLTDV	BEGINNING DECIMAL LESSONS	WORKING 8PF/R/DT
MATH	PLOT	FUNCTION PLOTTER	WORKING R/DT
MATH	SAP	SURVEY ANALYSIS PROGRAM	WORKING R/DT
MATH	TABLE	BEGINNING FRACTION LESSONS	WORKING 7PF/2DF/R/DT
MISCELLANEOUS			
MISCELLANEOUS	COMBN3	COMPUTER OMBUDSMAN	WORKING DT
MISCELLANEOUS	DIGLH1	DIGRAPH CALCULATIONS	WORKING 2PF/DT
MISCELLANEOUS	FOOD	FOOD FOR THOUGHT PROGRAM	UNCERTAIN 2PF/1DF/R/DT
MISCELLANEOUS	HANDS		WORKING R/DT
MISCELLANEOUS	RECIPE	NUTRITION PROGRAM	WORKING-NOT COMPLETE R/DT
MISCELLANEOUS	SEASON	INFORMATION ON BIRD MIGRATION	WORKING R/DT
MISCELLANEOUS	SEC	COMPUTER SECURITY SIMULATION LESSON	WORKING 3PF/R/DT
PHYSICS			
PHYSICS	CHARGE	MILLIKAN OIL DROP EXPERIMENT	WORKING R/DT
PHYSICS	SLITS	YOUNG'S DOUBLE SLIT EXPERIMENT	WORKING R/DT
PROGRAMMING			
PROGRAMMING	BASIC	BASIC LANGUAGE LESSONS	DEVELOPMENTAL-WORKING 7PF/R/DT
PROGRAMMING	ELBAS1	BASIC TRAINING MODEL	LISTING ONLY
SOCIAL STUDIES			
SOCIAL STUDIES	ECOGAM	PLANET MANAGEMENT GAME	WORKING 3PF/3DF/DT
SOCIAL STUDIES	ELECT	PRESIDENTIAL ELECTIONS & ELECTORATE	WORKING 3PF/R/DT
SOCIAL STUDIES	MALAR	MALARIA CONTROL SIMULATION	WORKING R/DT
SOCIAL STUDIES	MARKET	2 COMPANIES IN ONE PRODUCT COMPETITION	WORKING R/DT
SOCIAL STUDIES	POLIC2	NATIONAL POLICY FORMULATION SIMULATION	WORKING R/DT
SOCIAL STUDIES	POLSYS	CITY GOVERNMENT POLICY	WORKING R/DT
SOCIAL STUDIES	SAP	SURVEY ANALYSIS PROGRAM	WORKING R/DT
SOCIAL STUDIES	USPOP	U.S. POPULATION DYNAMICS STUDY	WORKING R/DT
SPANISH			
SPANISH	OBJS & DIRO	DRILL & PRACTICE ON OBJECTS/DIRECT OBJS	WORKING 2PF/R/DT
TEACHER EDUCATION			
TEACHER EDUCATION	IAC	FLANDERS INTERACTION ANALYSIS	WORKING DT
ZZ			
ZZ *			
ZZ * - KEY FOR 'STATUS' : PF - # PROGRAM FILES / DF - # DATA FILES / R - ROUTER / DT - ON DECTAPE			

ISAAC 10 APPENDIX C ROUTER: LISTING, PROGRAM FILES, SAMPLE RUN

LISTING

```
10 REM -- A COURSE ROUTER BY MARK PELCZARSKI --
20 FILE #2,"RNOTES"
30 RESTORE #2
40 READ #2,A$
50 IF A$="END" THEN 80
60 PRINT A$
70 GO TO 40
80 PRINT "PRESS -RETURN- TO GO ON";
90 INPUT A$
100 PRINT
110 LET M$="OPROGS"
120 FILE #1,M$
130 QUOTE ALL
140 PRINT "* * * * * * * * * * * * * * * * * * * * * * * * * * * * *"
150 PRINT
160 PRINT "CHOICES:"
170 PRINT
180 LET I=1
190 RESTORE #1
200 IF END #1 THEN 260
210 READ #1,M$,N$
220 PRINT I;") ";N$
230 PRINT
240 LET I=I+1
250 GO TO 200
260 PRINT I;") LEAVE A COMMENT"
270 PRINT
280 PRINT I+1;") EXIT THE ROUTER"
290 PRINT
300 PRINT "TYPE THE NUMBER OF YOUR CHOICE ";
310 INPUT N
320 IF N<1 THEN 390
330 IF N>I THEN 360
340 GOSUB 480
350 GO TO 150
360 IF N=I+1 THEN 980
370 PRINT "COME ON, PICK A NUMBER THAT WAS SHOWN . . . ";
380 GO TO 310
390 RESTORE #1
400 FOR I=1 TO N
410 READ #1,M$,N$
420 NEXT I
430 PRINT
440 PRINT "* * * * * * * * * * * * * * * * * * * * * * * * * * * * *"
450 PRINT
460 IF LEFT$(M$,1)<>"O" THEN 120
470 CHAIN M$
480 RESTORE #2
490 DIM S$(100)
500 LET N=0
510 IF END #2 THEN 550
520 READ #2,S$(N)
530 LET N=N+1
540 GO TO 510
550 IF N<101 THEN 580
560 PRINT "COMMENT SPACE IS FULL -- PLEASE NOTIFY YOUR INSTRUCTOR"
570 RETURN
580 SCRATCH #2
590 FOR I=0 TO N-1
600 WRITE #2,S$(I)
610 NEXT I
620 PRINT "ENTER YOUR COMMENT LINE BY LINE AND TERMINATE BY TYPING"
630 PRINT "'XXX' AT THE NEXT QUESTION MARK AFTER YOU ARE DONE."
640 PRINT "PLEASE DO NOT INCLUDE COMMAS IN YOUR COMMENT."
650 PRINT "INCLUDING YOUR NAME AND THE DATE IS USUALLY HELPFUL."
655 PRINT "MAXIMUM LENGTH OF LINE - - - - - - - - - - - - - - - - - -
- - -!"
660 INPUT A$
670 IF A$ ="XXX" THEN 690
680 RETURN
690 WRITE #2,A$
700 GO TO 660
710 REM  -- CONCERNING FILES FOR THIS PROGRAM --
720 REM  "RNOTES" IS FOR NOTES TO THE USER AND ALSO FOR COMMENTS
730 REM  FROM THE USER.  THE FIRST PART OF THE FILE SHOULD BE TO
740 REM  THE USER AND MUST BE TERMINATED WITH AN WITH A LINE
750 REM  CONTAINING ONLY THE WORD "END".  USER COMMENTS WILL BE
760 REM  APPENDED TO THE FILE. NOTE: EVEN IF THERE IS NO MESSAGE
770 REM  TO THE USER, THE WORD "END" MUST BE PRESENT - IN THIS CASE
780 REM  IT WOULD BE THE FIRST LINE OF "RNOTES".
790 REM
800 REM  PROGRAMS FOR THE ROUTER MUST (1) BE LISTED IN A PROGRAM
810 REM  FILE.  THE MAIN PROGRAM FILE IS "OPROGS".
820 REM  THIS FILE CONTAINS TWO LINES FOR EACH PROGRAM. THE FIRST IS
830 REM  ONLY THE PROGRAM NAME. THE SECOND IS A ONE LINE DESCRIPTION
840 REM  OF THE PROGRAM.  THE LATTER IS WHAT APPEARS TO THE USER.
850 REM  INSTEAD OF A PROGRAM NAME, ONE MAY ALSO SPECIFY A SECOND
860 REM  PROGRAM FILE, JUST LIKE "OPROGS" (FOR EXAMPLE: OMATH FOR
870 REM  MATH PROGRAMS).  THE TITLE LINE IN "OPROGS" WOULD THEN BE
880 REM  SOMETHING GENERAL LIKE "MATH PROGRAMS".  THE ROUTER WOULD
890 REM  GO TO THE "OMATH" FILE, IF THAT WERE THE CHOICE TAKEN, AND TREA
T
900 REM  IT JUST LIKE "OPROGS".  THESE PROGRAM FILES MAY BE NESTED.
910 REM  ANY PROGRAM FILE'S NAME MUST BEGIN WITH A ZERO TO BE RECOG-
920 REM  NIZED AS SUCH.  THE ONLY CONTENT OF THESE PROGRAM FILES
930 REM  ARE THESE SETS OF TWO LINES FOR EACH PROGRAM OR PROGRAM FILE
940 REM  (2)THE "STOP" STATEMENT IN THE ROUTED PROGRAM MUST BE REPLACED
950 REM  BY 'CHAIN "ROUTER",100', IF A STOP STATEMENT DOES NOT EXIST,
960 REM  REPLACE THE "END" STATEMENT WITH THE ABOVE AND CREATE A NEW
970 REM  END STATEMENT IMMEDIATELY FOLLOWING THE CHAIN.
980 END
```

PROGRAM FILES

OPROGS

```
50 BASIC
60 "BASIC LESSONS"
100 OHUNT
200 "HUNTINGTON II SIMULATIONS"
300 OADMIN
400 "ADMINISTRATION PROGRAMS"
500 OCAISP
600 "COMPUTER ASSISTED INDIV. STUDY PROGRAM
610 OMATH
620 "MATHEMATICS PROGRAMS"
700 OGAMES
800 "GAMES"
900 OMISC
1000 "MISCELLANEOUS"
```

OGAMES

```
10 LAFIV4
20 "LOST AND FORGOTTEN ISLAND"
100 RICH
200 "MOO"
300 GUESS
400 "GUESS"
410 HANG
420 "HANGMAN"
500 BJ
600 "BLACKJACK"
700 OPROGS
800 "RETURN TO MAIN INDEX"
```

SAMPLE RUN

```
PRESS -RETURN- TO GO ON ?

* * * * * * * * * * * * * * * * * * * * * * * * * * * * *

CHOICES:

 1 ) BASIC LESSONS

 2 ) HUNTINGTON II SIMULATIONS

 3 ) ADMINISTRATION PROGRAMS

 4 ) COMPUTER ASSISTED INDIV. STUDY PROGRAM

 5 ) MATHEMATICS PROGRAMS

 6 ) GAMES

 7 ) MISCELLANEOUS

 8 ) LEAVE A COMMENT

 9 ) EXIT THE ROUTER

TYPE THE NUMBER OF YOUR CHOICE  ?6

* * * * * * * * * * * * * * * * * * * * * * * * * * * * *

* * * * * * * * * * * * * * * * * * * * * * * * * * * * *

CHOICES:

 1 ) LOST AND FORGOTTEN ISLAND

 2 ) MOO

 3 ) GUESS

 4 ) HANGMAN

 5 ) BLACKJACK

 6 ) RETURN TO MAIN INDEX

 7 ) LEAVE A COMMENT

 8 ) EXIT THE ROUTER

TYPE THE NUMBER OF YOUR CHOICE  ?3

* * * * * * * * * * * * * * * * * * * * * * * * * * * * *


THIS IS A NUMBER GUESSING PROGRAM
THE COMPUTER WILL THINK OF A NUMBER BETWEEN 1 AND 100,
AND YOU ARE TO TRY TO GUESS WHAT IT IS.  WHENEVER YOU
MAKE A GUESS, THE COMPUTER WILL LET YOU KNOW HOW CLOSE
YOU ARE BY RINGING ITS BELL LIKE THIS --  THE MORE RINGS,
THE CLOSER YOU ARE...KEEP GUESSING (TYPE IN YOUR GUESS
WHEN YOU SEE A QUESTION MARK AND THEN PRESS 'RETURN'.
 ?33
```